CLAIMS

1. A solenoid comprising:

an excitation coil;

a slider disposed in a central part of the excitation coil; and

a yoke including a first yoke part that covers one end surface of the excitation coil and has a facing surface that faces an outer circumferential surface of the slider, a second yoke part that covers another end surface of the excitation coil and has a facing surface that faces the outer circumferential surface of the slider, and a linking part that links the first yoke and the second yoke and covers an outer circumferential part of the coil, the yoke forming a closed magnetic path together with the slider,

wherein a bearing is sandwiched between the first yoke part and the second yoke part, is disposed on an outer circumference of the slider, and guides the slider in a movable state, the bearing being made of a nonmagnetic body,

n (where n is a positive integer of 0 or higher) grooves, which are provided so as to be concave around an inner circumference, and n+1 tooth parts, which are adjacent to the grooves and function as magnetic poles, are provided in the facing surface of the first yoke part,

m (where m is a positive integer of 0 or higher) grooves, which are provided so as to be concave around an inner circumference and m+1 tooth parts, which are adjacent to the grooves and function as magnetic poles, are provided in the facing surface of the second yoke part,

n+1 grooves, which are provided so as to be concave around an outer circumference, and n+1 tooth parts, which are adjacent to the grooves and function as magnetic poles, are provided in a surface of the slider that faces the first yoke part, and

m grooves, which are provided so as to be concave around an outer

circumference, and m tooth parts, which are adjacent to the grooves and function as magnetic poles, are provided in a surface of the slider that faces the second yoke part.

2. A solenoid according to Claim 1,

wherein the facing surfaces formed on the first yoke part and the second yoke part have a same internal diameter.

3. A solenoid according to Claim 1,

wherein the grooves and the tooth parts are formed so as to be rectangular or trapezoidal in cross-section.

4. A solenoid according to Claim 2,

wherein the grooves and the tooth parts are formed so as to be rectangular or trapezoidal in cross-section.

5. A solenoid according to Claim 1,

wherein a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, is formed at a position that does not contact the bearing in a range where the slider moves.

6. A solenoid according to Claim 2,

wherein a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, is formed at a position that does not contact the bearing in a range where the slider moves.

7. A solenoid according to Claim 3,

wherein a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, is formed at a position that does not contact the bearing in a range where the slider moves.

8. A solenoid according to Claim 4,

wherein a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, is formed at a position that does not contact the bearing in a range where the slider moves.

9. A solenoid according to Claim 1,

wherein a recess is formed in the bearing so that a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, does not contact the bearing in a range where the slider moves.

10. A solenoid according to Claim 2,

wherein a recess is formed in the bearing so that a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, does not contact the bearing in a range where the slider moves.

11. A solenoid according to Claim 3,

wherein a recess is formed in the bearing so that a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, does not contact the bearing in a range where the slider moves.

12. A solenoid according to Claim 4,

wherein a recess is formed in the bearing so that a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, does not contact the bearing in a range where the slider moves.

13. A solenoid according to Claim 5,

wherein a recess is formed in the bearing so that a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, does not contact the bearing in a range where the slider moves.

14. A solenoid according to Claim 6,

wherein a recess is formed in the bearing so that a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, does not contact the bearing in a range where the slider moves.

15. A solenoid according to Claim 7,

wherein a recess is formed in the bearing so that a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, does not contact the bearing in a range where the slider moves.

16. A solenoid according to Claim 8,

wherein a recess is formed in the bearing so that a part, which is an upper end edge part of the groove provided in the slider and is located on a far side with respect to the bearing in an axial direction, does not contact the bearing in a range where the slider moves.